seems to be its normal state of distension, the diameter of the hydrocaulus is about half an inch. Its structure you can make out for yourself. The proximal ends of several of them were coated with mud when they came up; the longitudinal striæ were very evident in the soft tissue; fluid gravitated down the centre of the hydrocaulus, and collected in a bladder-like expansion at the base. The base of this stem was of a darker colour than the rest—a dull rose—in most of them (not in the one figured by Wild). As I did not mean to describe the creature I did not look out for processes or fibrillæ at the proximal extremity; you may find them in the spirit specimens. The total length of the hydranth when moderately extended was 1½ inches.

"The proximal range of tentacles number about a hundred, and these are about four inches long—they are almost transparent in life—of a pale pink colour in most specimens. The sporosacs are in close tufts of a maroon colour just at the base of the proximal tentacles. The specimen I looked at was a male, but the tissues were so soft—almost slimy—that I did not like to tease it too much. The walls of the body-cavity were yellowish, and seemed to contain some vertical rolls of glandular matter, and the hypostome terminates in a fringe of about forty-eight or fifty extensile tentacles round the mouth. So much for our gigantic Corymorphoid! These are the only two occasions on which we got it, or anything like it. I should have liked to get a haul or two in Behring's Sea, for there doubtless we should have had it in shallow water. I can only tell you one thing more about it—its associates. On the 17th of June, 1875, in 1,875 fathoms, it was associated with many fishes (Ophidoids, Macrurids, Scopellids—all the usual deep-sea lot), several Gasteropods, many Crustaceans (Dorippe, Galatea, Caridids, &c., and a fine Scalpellum), a few Annelids, many Echinoderms (Brisinga, Phormosoma, Ophiurids, two very fine Holothurids of a new group), species of Isis, Primnoa, Polythoa, and Actinia. On the 5th of July, in 2,900 fathoms, there were some worms (Aphroditacean), an Urchin allied to Diadema, two Holothuriæ, and one or two sponges; but the trawl-net was torn by the weight of the manganese nodules, so we had scarcely a fair sample of the fauna. In the bottle with the tube you will find among the horse-hair one or two pieces of *Heliopora cerulea* from Moseley. He sends at the same time a paper on it to the Royal."

That the enormous depths from which this colossal Hydroid has been brought up should favour the development of gigantic representatives of the diminutive forms of shallower zones, and that in the tenants of these sunless regions of the sea we should find colour not less vivid than that of their light-loving relatives, are facts full of significance.

It is also worth noticing that the sexual zooids of the great Hydroid are to all appearance simple sporosacs, instead of the medusiform zooids which are so frequent in the Gymnoblastic Hydroids of our littoral regions. Indeed, among the many Hydroids which I have examined from deep water, I have never found one which could be referred with probability to a form characterised by the production of medusiform zooids. It would seem that these zooids—delicate and active organisms which are among the most abundant captives of the towing-net in the surface-zone of the sea—are unable to endure, either before liberation from their parent Hydroid, or for a period however short in their free state, the darkness and pressure and other conditions to which the dwellers in the deep sea are exposed. GEORGE J. ALLMAN

NORDENSKJÖLD'S ARCTIC EXPEDITION

A LETTER from Prof. Nordenskjöld to Mr. Oscar Dickson, of Gothenburg, appears in the *Goteborgs Handels Tidning* of the 14th inst. It is dated "On board the *Pröven*, at anchor at the mouth of the Jenesej, 16th August, 1875." The following extracts may be of interest to our readers:—

"We are now employed as busily as possible in equipping the boat in which I, accompanied by Dr. Stuxberg, docent Lundström and three men, intend to sail up the Jenesej, with the view of returning to Europe across Siberia, while the other part of the expedition returns to Norway by sea, on board the *Pröven*.

"After the *Pröven*, on the 8th of June, was towed free of cost out of Tromsö by a little steamer of the same name, we were compelled to lie at anchor in the sound between Carlsö and Renö for five days, on account of a head wind. Finally, on the 14th, we could again weigh anchor and get to sea through Fuglö Sound. We thereupon set our course past North Cape, which we passed on the 17th, to the southern part of Novaya Zemlya.

"During spring and the early part of summer the west coast of this double island is, for some distance from the land, surrounded by a compact ice girdle, impassable at most places, which disappears later in the season, and in which, according to the experience of the fishermen, there are formed, generally at an early period, two sounds which are covered only with thin passable drift-ice, and by which the ice-free belt of water along the coast is connected with the ice-free ocean westwards. One of these open channels is usually situated off Matotschkin Scharr, and its formation is caused by the strong currents which prevail in that sound; the other is to be found about the latitude of Severo Gusinnoi Mys, or North Goose Cape. The latter was chosen by me for the *Pröven*, and was passed without any special difficulty on the 22nd of June. The expedition thus, in seven days from its departure from Carlsö, cast anchor for the first time at Novaya Zemlya, in a little ill-protected bay immediately north of North Goose Cape.

"During the voyage there were set on foot, when the state of the weather permitted, frequent soundings and dredgings, examinations of animal and diatom life in the surface of the sea, determinations of the temperature at different depths, &c. Our operations were generally very successful, and showed that in this sea we may reckon on reaping rich harvests in natural history. We also made repeated trials at different depths of a new instrument for bringing up specimens of the bottom, constructed for the expedition by Dr. Wiberg, which showed itself very well adapted for the purpose, and easily managed."

After visiting and examining various parts of the coast for many days, the *Pröven* was directed to the Sea of Kara, and on the 26th July the anchor was let go off Cape Grebeni, on Waigats Island. So violent a storm was raging, however, that a boat could not be sent out till the 30th July to land on Waigats Island. "A rich collection was here made of Upper Silurian fossils, strongly resembling those from Gotland, and therefore of special interest for Swedish geologists. Here we for the first time encountered Samoyedes, who when they sighted the vessel drove down to the shore in peculiar high sledges adapted for travelling in both summer and winter, and drawn by three or four reindeer. They immediately gave us to understand that they wished to come on board, whither they also accompanied us in our boat, and where they were soon afterwards well entertained by us.

"During our stay on the west coast of Novaya Zemlya we of course instituted numerous investigations regarding the geology, animal and vegetable life, &c., of the regions visited by us, and the number of the places on the coast where we landed rendered it possible for the scientific staff of the expedition to collect materials for ascertaining the natural relations of these regions, which are certainly far more extensive than have been brought home by any of our predecessors." At last on August 2 the sound was successfully passed, and on the *Pröven* reaching the Sea

of Kara it was found completely free of ice! "Our course was set towards the middle of the peninsula which separates the Sea of Kara from the Bay of Obi, and is named Jalmal by the Samoyedes. The wind was very moderate, so that we only advanced slowly—a circumstance by which our patience was in truth sorely tried, but which had this good result, that during our sailing forward in these waters visited for the first time by a scientific expedition, we were able daily to undertake dredgings, hydrographic work, &c. The dredgings gave an unexpectedly rich and various harvest of marine animals, among which I will specially mention here several colossal species of Isopoda, masses of Amphipoda and Copepoda, a large and beautiful Alecto, uncommonly large Ophiurids, beautifully marked Asterids, innumerable mollusca, &c. The peculiar circumstance here occurs that the water at the surface of the sea, which in consequence of the great rivers which debouch in these regions is nearly free of salt, forms a deadly poison for the animals which live in the salt water at the bottom. Most of the animals brought up from the bottom accordingly die if they are placed in water from the surface of the sea.

"Here, as on the west coast of Novaya Zemlya, were instituted, when opportunity offered, with the thermometers by Negretti and Zambra and Casella procured by you during your stay in London last spring, determinations of the temperature of the sea, not only at the surface, but also at different depths under it. These investigations yielded a specially interesting result, and perhaps may be regarded as conclusive of a number of questions regarding which there has of late been much discussion concerning the ocean currents in these regions, the direction of which, in the absence of other data, it has been attempted to determine chiefly by the temperature of the surface water. By means of numerous observations along the west coast of Novaya Zemlya from Matotschkin Scharr to Jugor Sound, and thence past Cape Grebeni to 75½° N. lat. and 82° E. long., and on to the mouth of Jenisej, I have obtained indisputable proof that in this sea the temperature of the sea-water at the surface is exceedingly variable and dependent upon the temperature of the air, upon the neighbourhood of ice, and upon the influx of warm fresh water from Obi and Jenesej, but that the temperature of the water at a depth of only ten fathoms is nearly quite constant, between − 1° and 2° C. If, in the northern part of the Sea of Kara, where the water on the surface is almost completely *free of salt*, and at this time of the year very warm, a flask filled with water from the surface is sunk to a depth of ten fathoms, the water freezes to ice. There are thus no warm ocean currents here at any considerable depth below the surface. A large number of deep-water samples have been taken by the apparatus constructed by Prof. Ekman, which is exceedingly well adapted for the purpose, and I am convinced that at the bottom the content of salt is also constant, which can be ascertained with certainty after the return of the expedition by analyses of the samples of water which have been taken.

"On the 8th August we landed for a few hours on the north-western side of Jalmal, where an astronomical determination of the position of the place was made. A great many astronomical determinations had previously been made during the expedition along the west coast of Novaya Zemlya and Jugor Sound. Traces of men, some of whom had gone barefoot, and of Samoyede sledges, were visible on the beach. Close to the shore was found a sacrificial altar, consisting of about fifty skulls of the Ice Bear, Walrus, and Reindeer bones, &c., laid in a heap. In the middle of the heap of bones there stood, raised up, two idols, roughly hewn from drift-wood roots, newly besmeared in the eyes and mouth with blood, also two poles provided with hooks, from which hung bones of the Reindeer and Bear. Close by was a fireplace and a heap of Reindeer bones, the latter clearly a remnant of a sacrificial meal. After a stay here of several hours, I sailed further north, until further advance in this direction was prevented by impassable masses of great even icefields at 75° 30′ N. lat., and 79° 30′ E. long. Afterwards I followed the edge of the ice eastwards, and finally steered our course towards the north side of the mouth of Jenisej, where the Swedish flag was hoisted and the anchor was let go on the 15th in the afternoon. We had now attained the goal which great seafaring nations had in vain striven for centuries to reach.

"The expedition will now, in accordance with the plan agreed upon, separate, inasmuch as I, accompanied by Lundström and Stuxberg, and three men, intend, in a Nordland boat brought with us for the special purpose, to sail or row up the Jenisej, in order to return by Turuchansk and Jeneseisk to Europe, while the *Pröven* returns hence to Norway, if possible going north of the north point of Novaya Zemlya."

SCIENCE IN GERMANY

(*From a German Correspondent.*)

SINCE we possess in the kinetic molecular theory, as founded by Clausius, a mechanical theory based on the atomic conception of gases, it is possible to employ the results of the chemical investigation of these bodies for physical deductions. It is only necessary to suppose for this purpose that *the same* molecules, which are the bearers of the thermal and mechanical properties of gases, act reciprocally in chemical reactions. We must point out as one of the most important confirmations of this view, that Avogardo's hypothesis, based on general physical deductions, and adopted in chemistry as the foundation-stone of its whole recent development, has lately found its mechanical confirmation in the gaseous theory of Maxwell and of Boltzmann.

Recently, however, difficulties have arisen in the further investigation of this theory, with regard to the specific heat of gases. The quantity of heat contained in a gas is defined as the total energy of its molecules, and this energy consists solely in progressive motion, if the molecule is looked upon as a mere material point. On the other hand, the pressure of the gas upon the surface-unit equals two-thirds of the kinetic energy of progressive motion contained in the volume-unit. If, therefore, we raise the temperature of the gas by one degree, the volume remaining the same, we can find by calculation the adduced quantity of heat according to the gaseous theory, from the increase of pressure determined by Mariotte-Gay Lussac's law. This quantity of heat in its relation to the mass-unit, is, as is known, called the specific heat of the gas at the constant volume (c), and calculation now shows this value to be 0·60 of the observed one. In close connection with this it was found that the proportion of specific heat at constant pressure (c') to the specific heat at constant volume (c), viz. $\frac{c'}{c} = k$ is = 1·67 according to the theory mentioned, but = 1·405 according to observation.

Clausius has shown that the theoretical value of c is certainly increased, if we take into account that according to the results of chemical researches the molecules of the gases hydrogen, oxygen, and nitrogen are *not* material points, but polyatomic, and that they are thus capable of storing, as it were, a certain quantity of energy in the shape of motion relative to a centre of gravity. But when Boltzmann lately investigated the behaviour of polyatomic gas molecules according to mechanical principles, he found c for a diatomic gas (like hydrogen, oxygen, nitrogen) to be 1·22 times more than observation shows. He found by calculation k = 1·33, and this value is *smaller* than the actual one (1·405). We must remark here that the supposition of a number of atoms larger than